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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/615,745	07/09/2003	Amos Chou	TS01-1004	1845
54657	7590	04/17/2006	EXAMINER	
DUANE MORRIS LLP IP DEPARTMENT (TSMC) 30 SOUTH 17TH STREET PHILADELPHIA, PA 19103-4196			SRIVASTAVA, KAILASH C	
			ART UNIT	PAPER NUMBER
			1655	

DATE MAILED: 04/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/615,745	Applicant(s) CHOU ET AL.	
	Examiner Dr. Kailash C. Srivastava	Art Unit 1655	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 January 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 11-13 and 16-24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 14 and 15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>14/10/2003</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's response filed 27 January 2006 to Office Action mailed 5 January 2006 is acknowledged and entered.

Claims Status

2. Claims 1-24 are pending.

Restriction/Election

3. Applicants' election without traverse of Group I, Claims 1-10 and 14-15 filed 27 January 2006 in response to Restriction requirement in Office Action of 05 January 2006 is acknowledged and entered. Since the election is made without traverse, the restriction requirement is deemed proper and is made FINAL.

Accordingly, Claims 11-13 and 16-224 are withdrawn from further consideration as being directed to a non-elected invention. See 37 CFR §1.142(b) and MPEP § 821.03. Examiner suggests that the non-elected claims cited *supra* be canceled in response to this Office action to expedite prosecution.

4. Claims 1-10 and 14-15 are Examined on merits.

Information Disclosure Statement

5. Applicant's Information Disclosure (i.e., IDS) filed 14 October 2003 has been made of record and considered.

Objection To Specification

6. 35 U.S.C. §112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms, which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. §112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are: e.g., Page 6, Line 22, "shown the fabrication of Fig. 2". It is not clear to the Examiner that the fabrication of Figure 2 is demonstrated in Figure 3, nor how Figure 2 can be fabricated"? Applicant should carefully revise the specification including the abstract to make the specification clearly comprehensible. Applicant is warned to be careful to not add any new matter while revising the application for corrections to eliminate inexact or verbose terms.

Examiner has not checked the entire specification to determine the presence of all possible minor errors. Applicant's cooperation is required in correcting any errors of which applicant may become aware in the specification. Applicants are warned to be careful to not add any new matter while revising the application for corrections to eliminate any verbose or incorrect terms/language.

Objection To Claims

7. Claims are objected to because of the following:

- Claims 2-10 and 14-15 are objected to because at Line one of the cited Claims, before the word "wherein" a --, -- should be inserted.
- Claim 5, Lines 6-7 is objected to because of the phrase "predetermined thickness of the microorganism seeded culture medium has been attained". It is not clear to the Examiner how the medium thickness will increase over time? Is it the thickness of the microbial growth on the medium that the applicants are referring to in said phrase, or the thickness of the medium?"
- It seems that Claim 5; Lines 8-11 describe more than one step. The applicants, however, have mingled them together in one paragraph. Thus, those steps are very difficult to understand. Examiner suggests that applicants present those claims clearly by starting each step on a separate line.
- Phrase, "wherein the microorganisms seeding the culture medium are specific cell lines appropriate to the medium makes the entire claim 9 unclear. Examiner is puzzled because the microorganisms do not seed a culture medium themselves; rather the culture medium is seeded with the microorganisms. Furthermore, who, when and how determined the "appropriateness" of specific cell lines to a medium or the appropriateness of a medium to the cell lines, the microorganisms, the medium or someone else? What are the criteria to determine said appropriateness?

Appropriate correction is required.

Examiner has not checked all the Claims to determine the presence of all possible minor errors/ verbose terms or repugnant words. Applicants' cooperation is required in correcting any errors of which applicant may become aware in the Claims. Applicant is warned to be careful to not add any new matter while revising the Claims for corrections to eliminate any verbose or repugnant or incorrect terms/language.

Claim Rejections – 35 U.S.C. § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

9. Claims 1-2, 4-5, 7-9 and 14-15 are rejected under 35 U.S.C. § 102(b) as anticipated by Jeng et al (English Abstract of Taiwanese Patent TW 529103).

Claims recite a method to form a low-k dielectric layer, wherein a substrate is provided, an organic growth occurs on said substrate and the organic growth comprising living organisms is sacrificed. In said method some part of the substrate is covered with said dielectric layer. Said layer is formed via applying a culture medium to said substrate, seeding a microorganisms on said culture medium, letting the microbial growth occur, drying the microbial growth along with the culture medium for said microbial growth to eliminate "intercellular" (may be "intracellular") material, whereby the microbial layer is hardened.

Jeng et al. teach a method to manufacture a low di-electric constant film by a biological process comprising growing microorganisms on a culture medium applied to a semiconductor substrate containing a number of metal lines, wherein the medium is a layer of silicon-di-oxide. The microorganism having a silicon-rich shell or a cell wall grows because subsequent to applying silicon-dioxide layer and seeding said layer with said microorganism the semiconductor with metal lines and seeded microorganisms is dipped in a liquid culture medium to allow said microorganisms to growth. Subsequent to microbial growth, the liquid medium is withdrawn, the microbial layer washed and dried. Because of the drying the microbial cell wall is filled with air or the inert gas that is applied to dry the microbial growth and the remnant material has a low di-electric constant. Note that the prior art method applies the same steps and the same components to make said di-electric material on the semiconductor as are instantly claimed.

Therefore, the reference deems to anticipate the cited claim.

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claim 1 is rejected under 35 U.S.C. § 102(b) as anticipated by a rock with microbial growth on it, wherein said rock has been extracted out of the river bed or dries in sun when the river recedes.

Claim 1 recites a method to form a low-k dielectric layer, wherein a substrate is provided, an organic growth occurs on said substrate and the organic growth comprising living organisms is sacrificed.

A rock having microbial growth on it in form of a slime from the growth of algae, bacteria or slime mold, upon being removed from underneath the water because of extraction from the river bed, or receding of the river water is a substrate on which microbial, i.e., organic growth has occurred. Upon exposure to atmosphere, said rock is exposed to sunlight and air (i.e., warm air), whereby the microbes die, i.e., sacrificed and the remaining sacrificed layer formed on the rock is a low-k-dielectric layer. Note that said low-k-dielectric layer has been formed according to the same steps with same ingredients (i.e., a substrate-rock and ingredients, viz., naturally occurring growth medium for microbes and the dead microbe as re claimed instantly.

Therefore, the reference deems to anticipate the cited claim.

12. Claims 1 and 2 are rejected under 35 U.S.C. § 102(b) as anticipated by a computer board/chip thrown in a river, embedded in a landfill or buried in a trash dump and then excavated from the river bed because of the receding river water or because of the excavation of the landfill or tilling of the trash dump site.

Claims recite a method to form a low-k dielectric layer, wherein a substrate is provided, an organic growth occurs on said substrate and the organic growth comprising living organisms is sacrificed.

After a computer board/chip is thrown in to a river or is embedded in a landfill or buried in a trash dump at sump site, during the time that said computer board/chip was in said environments, slimy microbial growth inherently occurs on said computer board/hip. When said board/chip with microbial growth on it is exposed to sun and air, subsequent to its excavation from river bed or because of the receding river water, excavation from said landfill or tilling of said trash dump, the microbial growth on said substrate (i.e., the computer board or chip) is inherently sacrificed because of the warm air (air and sunlight) and consequently forms a low-k-dielectric layer on said computer board/chip. Note that said low-k-dielectric layer has been formed according to the same steps with same ingredients (i.e., a substrate-rock and ingredients, viz., naturally occurring growth medium for microbes and the dead microbe as re claimed instantly.

Therefore, the reference deems to anticipate the cited claim.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR §1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. § 102(f) or (g) prior art under 35 U.S.C. § 103(a).

15. Claims 1-10 and 14-15 are rejected under 35 U.S.C. § 103 (a) as obvious over combined teachings from the river-bed stone example and the computer board example in view of Jeng et al. (English Abstract of Taiwanese Patent TW 529103) and Shue et al (US Patent 6,610,592).

Claims recite a method to form a low-k dielectric layer, wherein a substrate is provided, an organic growth occurs on said substrate and the organic growth comprising living organisms is sacrificed. In said method some part of the substrate is covered with said dielectric layer. Said layer is formed via applying a culture medium to said substrate, seeding a microorganisms on said culture medium, letting the microbial growth occur, drying the microbial growth along with the culture medium for said microbial growth to eliminate "intercellular" (may be "intracellular") material, whereby the microbial layer is hardened. Subsequently forming a capping layer over the low-k-dielectric layer and planarizing said capping layer. Said capping layer is a layer of silicon dioxide, the culture medium fills the spaces between the metal lines, the nutrients are specific to the growth of said seeded microorganisms and the culture medium with said microorganism layer on it is dried in air or an inert gas.

Teachings from Riverbed Stone Example, Computer board Example and Jeng et al. have been discussed *supra*. Jeng et al., and the examples discussed *supra*, however, do not teach a capping layer or planarizing said capping layer. Shue et al. teach capping and planarizing said capped layer to form structural pillars (Abstract, Lines 1-16; Column 1, Line 58- Column 2, Line 41).

Thus, it would have been *prima facie* obvious to one of ordinary skill in the art at the time the claimed invention was made to combine the teachings from Jeng et al. with those of Shue et al. because Jeng et al. teach preparing a dielectric layer on a semiconductor with metal lines via a biological process of growing the microorganism on said semiconductor and drying said microbial growth with air or inert gas and Shue et al. teach growing a dielectric layer, covering said layer and planarizing said layer.

One having ordinary skill in the art at the time of the claimed invention would have been motivated to modify/combine the teachings from combined teachings from Jeng et al. and Shue et al., because as discussed *supra*, Jeng et al. teach preparing a dielectric layer via a biological process of growing a microorganism on a semiconductor, wherein microorganism has a silicon containing cell wall and Shue et al. teach preparing a dielectric layer, covering said layer and planarizing said layer according to same steps and applying the same ingredients (i.e., silicon-rich microorganism wall, drying with air or inert gas, as is instantly claimed. The prior art references cited above do not teach the exact same range of microbial layer thickness or microbial cell lines. However, adjustment of particular conventional working conditions (e.g., choice of thickness or similar effecting, microbial cell lines.) is deemed merely a matter of judicious selection and routine optimization of a result-effective parameter that is well within the purview of the skilled artisan.

From the teachings of the references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

16. The prior art made of record and not relied upon is considered pertinent to Applicants' disclosure.
- Bogart et al. U.S. Patent 5,468,606. Issued 21 November 1995.

Claim Rejections - 35 U.S.C. § 112

17. The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

18. Claims 1-10, and 14-15 are rejected under 35 U.S.C. §112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.
- Recitation "providing" in claim 1 is vague and indefinite because said recitation does not clearly define the metes and bounds of the claimed subject matter.

- Recitation, "at least partially covered by" in Claim 3 renders that Claim unclear, vague and indefinite because it is not clear which and/or how much part of the claimed substrate is covered with said "protective and adhesion enhancing dielectric layer"? The metes and bounds for the phrase, "at least partially covered by" should be defined.
- The recitation, "enhancing" in Claims 3 and 7 renders those claims unclear, vague and therefore, indefinite. The recitation "enhancing" in claim 3 is a relative term that renders said claim indefinite. Recitation "enhancing" is not defined by the claim, the specification does not provide a clear cut standard for ascertaining the requisite degree, and one skilled in the art would not be reasonably apprised of the scope of the invention because the metes and bounds of the recitation "enhancing" are not clear. Applicants need to define the metes and bounds for the recitation, "enhancing".
- Phrase, "cell walls filled with intercellular material" at Claim 5, Line 5 renders Claim 5, unclear and vague. It looks like that applicants intend to state "intracellular material". The phrase, however, is not clear. Applicants should clarify whether the phrase is "cell walls filled with intercellular material" or "cell walls filled with intracellular material".
- Applicants should also clarify if the recitation, "intercellular material" at Claim 5, Line 9 is indeed "intercellular material" or "intracellular material"?
- The phrase, "so as to" in Claim 7 renders that claim indefinite, unclear and vague. This is because the metes and bounds for said phrase are not defined. Examiner suggests replacing the indefinite phrase "so as to" with the word, "to" to clearly define said ambiguous limitation.

All other claims depend directly from the rejected claims (e.g., Claims 1) and are, therefore, also rejected under 35 U.S.C. §112, second paragraph for the reasons set forth above.

Conclusion

19. For reasons aforementioned, no Claims are allowed.

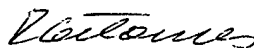
20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Kailash C. Srivastava whose telephone number is (571) 272-0923. The examiner can normally be reached on Monday to Thursday from 7:30 A.M. to 6:00 P.M. (Eastern Standard or Daylight Savings Time).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Terry McKelvey, can be reached on (571)-272-0775 Monday through Friday 8:30 A.M. to 5:00 P.M. The fax phone number for the organization where this application or proceeding is assigned is (571)-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding may be obtained from the Patent Application Information Retrieval (i.e., PAIR) system. Status information for the published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (i.e., EBC) at: (866)-217-9197 (toll-free). Alternatively, status inquiries should be directed to the receptionist whose telephone number is (703) 308-0196.

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April 11, 2006



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